Claim Amendments

There are no claim amendments.

Listing of Claims

1. (previously presented) A method for treating a gate structure comprising a high-K gate dielectric stack to reduce interface states between a high-K gate dielectric and a gate electrode comprising the steps of:

providing a gate dielectric layer stack comprising a high-K gate dielectric over a semiconductor substrate;

forming a gate electrode layer on the gate dielectric layer stack;

lithographically patterning and etching to form a gate structure; and,

carrying out at least one plasma treatment of the gate structure following formation of the gate structure, said at least one plasma treatment comprising a plasma source gas selected from the group consisting of H_2, N_2, O_2, NH_3, and combinations thereof.

2. (Original) The method of claim 1, further comprising the step

of annealing the gate structure following the at least one plasma treatment.

3. (Original) The method of claim 2, wherein the step of annealing comprises a temperature of from about 600 °C to about 750 °C.

4. (Original) The method of claim 2, wherein the step of annealing comprises an ambient consisting essentially of nitrogen.

5. (previously presented) The method of claim 1, wherein the gate dielectric layer stack comprises a lowermost SiO_2 layer formed over the semiconductor substrate.

6. (previously presented) The method of claim 1, wherein the gate dielectric layer stack comprises a high-K material selected from the group consisting of tantalum oxides, titanium oxides, hafnium oxides, yttrium oxides, lanthanum oxides, zirconium oxides, and silicates and aluminates thereof.

7. (Original) The method of claim 1, wherein the dielectric layer stack consists essentially of a lowermost SiO_2 layer and an

overlying hafnium oxide layer.

8. (Original) The method of claim 7, wherein the hafnium oxide layer is formed according to an ALCVD method at a temperature of less than about 300 °C.

9. (previously presented) The method of claim 1, wherein the at least one plasma treatment consists of a plasma source gas selected from the group consisting of hydrogen (H_2), nitrogen (N_2), and combinations thereof.

10. (canceled)

11. (Original) The method of claim 1, wherein the plasma treatment is carried out at a pressure of between about 100 mTorr and about 10 Torr.

12. (canceled)

13. (previously presented) A method for treating a gate structure comprising a high-K gate dielectric stack to reduce interface states at a high-K gate dielectric/gate electrode interface comprising the steps of:

providing a gate dielectric layer stack comprising at least one high-K dielectric over a semiconductor substrate;

forming a gate electrode layer on the high-K dielectric;

lithographically patterning and etching to form a gate structure;

carrying out at least one plasma treatment of the gate structure following formation of the gate structure, said at least one plasma treatment comprising a plasma source gas selected from the group consisting of H_2, N_2, O_2, NH_3, and combinations thereof; and,

annealing the gate structure following the at least one plasma treatment.

14.(Original) The method of claim 13, wherein the step of annealing comprises a temperature of from about 600 °C to about 750 °C.

15. (previously presented) The method of claim 14, wherein the

step of annealing comprises an ambient selected from the group consisting of H_2, N_2, O_2, NH_3, and combinations thereof.

16. (previously presented) The method of claim 13, wherein the gate dielectric layer stack comprises a lowermost SiO_2 layer formed over the semiconductor substrate.

17. (Original) The method of claim 13, wherein the high-K dielectric is selected from the group consisting of tantalum oxides, titanium oxides,, hafnium oxides, yttrium oxides, lanthanum oxides, zirconium oxides, and silicates and aluminates thereof.

18. (Original) The method of claim 13, wherein the gate dielectric layer stack consists essentially of a lowermost SiO_2 layer and an overlying hafnium oxide layer.

19. (previously presented) The method of claim 13, wherein the at least one plasma treatment consists of a plasma source gas selected from the group consisting of hydrogen (H_2), nitrogen (N_2), and combinations thereof.

20. (Original) The method of claim 13, wherein the plasma

treatment is carried out at a pressure of between about 100 mTorr and about 5 Torr.

21. (previously presented) A method for treating a gate structure comprising a high-K gate dielectric stack to improve electric performance characteristics comprising the steps of:

providing a high-K gate dielectric layer over a semiconductor substrate;

forming a gate electrode layer on the high-K gate dielectric layer;

patterning said gate electrode layer and gate dielectric layer to form a gate structure; and,

providing a treatment of the gate structure following formation of the gate structure, said treatment selected from the group consisting of a thermal treatment and at least one plasma treatment, said treatment reducing interface states between the gate electrode layer and the high-K gate dielectric layer.

22. (previously presented) The method of claim 21, wherein the

treatment comprises a plasma treatment followed by the thermal treatment.